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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/910,795	07/24/2001	Luc Ouellet	11672-US	2984

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EXAMINER

VINH, LAN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/910,795

Applicant(s)

OUELLET ET AL.

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 7/24/2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-26 is/are allowed.
- 6) ☒ Claim(s) 1-15, 17-19, 27-29 is/are rejected.
- 7) ☒ Claim(s) 16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

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## **DETAILED ACTION**

### ***Claim Objections***

1. In line 1 of claim 17, the term "in claim 17" appears to be a typographical error because it is unclear which claims (15 or 16) that claim 17 depends upon. Correction is required.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 recites the limitation "said first sacrificial layer" in line 4. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2, 7-15, 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Fitch et al (US 5,510,645)

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Fitch discloses a method for forming the semiconductor structure comprises the steps of:

forming a dielectric material layer 26 of silicon dioxide on the substrate 12 (col 7, lines 63-64, col 8, lines 21-22, fig. 13), which reads on forming a layer of etchable material on the substrate

forming a silicon nitride layer 30/claimed mechanically stable support layer over the dielectric layer 26/etchable material layer (col 8, lines 21-28)

dry etching the silicon nitride layer 30/support layer to form opening 35 extending through the layer 30 into layer 26/etchable layer using X-ray lithography (col 8, lines 57-59, col 10, lines 28-29, fig. 13), which reads on performing an anisotropic etch through a mask to form an opening/hole extending through the support layer into the etchable material. Fig. 17 of Fitch shows a pattern of openings/holes 35, the openings 35 are being separated by a distance

performing an isotropic etch through the opening 35 to form a air region 28/cavity in the dielectric layer/etchable material 26 under the opening and extending under layer 30/support layer (col 9, lines 60-61, fig. 14)

forming a dielectric layer 36 by PECVD/depositable material over layer 30/support layer until portion of layer 36 overhangs and closes the air region 28/cavity formed under the opening/hole 35 (col 9, lines 21-41, fig. 15)

Regarding claim 2, fig. 17 of Fitch shows the openings/holes 35 are arranged in a pattern along a path forming the channel.

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Regarding claim 7, fig. 17 of Fitch shows that the openings/holes 35 are being separated by a distance such that the air region/cavities do not overlap

Regarding claim 8, fig. 14 of Fitch shows a T-shaped channel 35

Regarding claim 9, fig. 28 of Fitch shows a cross-shaped pattern of channel 43

Regarding claim 11, fig. 28 of Fitch shows a pattern of openings/holes 43 with a narrow portion and a wide portion

Regarding claims 12-13, Fitch discloses forming a dielectric layer by PECVD (col 7, lines 17-20)

The limitation of claim 14 has been discussed above.

Regarding claim 15, Fitch discloses forming a sacrificial layer 28 of TiN under the layer 30/support layer (col 8, lines 11-14, fig. 14)

Regarding claim 17, Fitch discloses the step of etching to remove the sacrificial layer 28 after forming the opening/channel 35 (col 9, lines 15-16)

5. Claims 27-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Fitch et al (US 5,510,645)

Fitch discloses a method for forming the semiconductor structure comprises the steps of:

forming a dielectric material layer 26 of silicon dioxide on the substrate 12 (col 7, lines 63-64, col 8, lines 21-22, fig. 13), which reads on forming a layer of etchable material on the substrate

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forming a silicon nitride layer 30/claimed mechanically stable support layer on a sacrificial layer 28 (fig. 13; col 8, lines 21-28)

dry etching the silicon nitride layer 30/support layer to form opening 35 in the layer 30 (col 8, lines 57-59, col 10, lines 28-29, fig. 13). Fig. 17 of Fitch shows a pattern of openings/holes 35

performing an isotropic etch through the opening 35 to form a air region 28/cavity in the dielectric layer/etchable material 26 under the opening and extending under layer 30/support layer (col 9, lines 60-61, fig. 14)

forming a dielectric layer 36 by PECVD/depositable material over layer 30/support layer until portion of layer 36 overhangs and closes the air region 28/cavity formed under the opening/hole 35 (col 9, lines 21-41, fig. 15)

Regarding claim 28, fig. 17 of Fitch shows the openings/holes 35 are arranged in a pattern along a path forming the channel.

Regarding claim 29, Fitch discloses forming the layer 36 by exposing seed layer 32 (silicon) to  $\text{SiH}_4$  with an optional oxygen gas using PECVD technology (col 9, lines 20-40), which reads on forming a dielectric material of silicon dioxide by PECVD.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fitch et al (US 5,510,645) in view of Levine et al (US 5,902,165)

Fitch's method has been described above. Unlike the instant claimed inventions as per claims 3-6, Fitch does not disclose the claimed specific size of the hole/opening and distance between the hole.

However, Levine discloses a method of forming semiconductor device having cavities comprises the step of forming apertures/openings 26 having diameter of 1.0-1.4 microns, at 3 microns aperture pitch/distance (col 5, lines 65-67)

Hence, one skilled in the art would have found it obvious to modify Fitch's method by forming apertures/openings having specific diameter and distance as taught by Levine because according to Levine self-alignment techniques can be used in obtain initial alignment of the subcavities with aperture having the specific sizes (col 5, lines 3-9)

8. Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fitch et al (US 5,510,645) in view of Habermehl et al (US 6,174,820)

Fitch's method has been described above. Unlike the instant claimed inventions as per claims 18-19, Fitch does not disclose forming the etchable material/dielectric layer onto a substrate containing an active device such as a CMOS

However, Habermehl discloses a method for forming microelectromechanical device comprises the step of forming an etchable material layer onto a substrate containing an active device such as a CMOS (col 11, lines 50-53)

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Hence, one skilled in the art would have found it obvious to modify Fitch's substrate by forming an active device such as a CMOSi in the substrate as per Habermehl because Habermehl states that an substrate can be used to form electronic circuitry by one set of standard CMOS (col 11, lines 51-54)

***Allowable Subject Matter***

9. Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 20-26 allowed.

The following is a statement of reasons for the indication of allowable subject matter/ reasons for allowance: Regarding claims 16, 20, the cited prior art of record fails to disclose the step of forming a sacrificial/a second sacrificial layer on top/on the support layer. Since the closest prior art of Fitch et al (US 5,510,645) discloses forming a single sacrificial layer 28 under the nitride/support layer 30 to fill the region between the region 26, altering the position of Fitch layer 28/adding additional sacrificial layer to Fitch semiconductor structure would have destroyed the operation of Fitch semiconductor device.




***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703 305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.



LV

September 24, 2003